

# NIOSH PPT Activities to Support Strategic Goal #1: Reduce Exposure to Inhalation Hazards

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# Organization/Staffing/Funding

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- **This strategic goal is supported by multiple divisions & locations within NIOSH**
- **NPPTL is the lead division for this strategic goal**
  - NPPTL has inhalation related projects in each of its three branches
- **NIOSH PPT intramural portfolio includes ~ 40 Inhalation projects, including 21 posters here today**
- **FY09 funding for inhalation projects ~\$10 million (~85% of the NIOSH PPT Program)**

# NIOSH PPT Strategic Goal # 1

## Program Objectives

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- 1. Ensure the integrity of the national inventory of respirators through the implementation of a respirator certification process with an emphasis on efficiency, integrity and fairness**
- 2. Develop contemporary respirator standards to reduce exposure to known and emerging hazards including CBRN**
- 3. Advance the state of technology for closed circuit breathing systems for mine disasters and other emergencies**
- 4. Improve the reliability and level of respiratory protection provided by influencing respirator designs that better fit the range of facial dimensions of respirator users in the global workforce**

# NIOSH PPT Cross Cutting Objectives Applicable to All Strategic Goals

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1. **Evaluate the physiological and ergonomic impact of PPE on individual wearers**
2. **Understand and improve the effectiveness and usability of PPE to reduce the transmission of infectious bioaerosols**
3. **Evaluate the effectiveness of PPT for protection against nanoparticles**
4. **Understand and improve the efficacy and effect of decontamination procedures for PPT**
5. **Develop and foster deployment of technologies that reliably sense or model PPT performance to ensure users receive effective protection**
6. **Evaluate integration and interoperability of PPT components and the protection provided by composite use of PPT**
7. **Develop and implement standards to address PPT gaps**
8. **Gather information on the use and usability of PPT in the workplace to identify research, standards, evaluation, intervention, and outreach needs**

# Reduce Exposure to Inhalation Hazards

## Objective #1

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**Ensure the integrity of the national inventory of respirators through the implementation of a respirator certification process with an emphasis on efficiency, integrity and fairness**

# Program Areas Related to Respirator Certification & Post-Approval

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- **NPPTL Technology Evaluation Branch**

- Carry out activities specified in 42 CFR Part 84: Respirator Certification & Post Approval

- **NPPTL Policy and Standards Development Branch**

- Revisions to 42 CFR Part 84 via modular approach to rulemaking
- Responsive to new technologies and test methods

- **Participation on National and International Consensus Standards Development Organizations (ISO, NFPA, ANSI, ASTM) (also supports cross cutting objective #7)**

# Respirator Certification Program

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**Averaging over 400 approval  
actions per year:**

**Approximately 100 new approvals**

**Approximately 300 modifications of approval  
issued**

**93 manufacturers  
105 manufacturing sites  
18 countries**

**US, Australia, Brazil, Canada, Chile, China, Denmark, England, Finland,  
Germany, Italy, Japan, Korea, Mexico, New Zealand, Taiwan, Thailand, Sweden**

# Respirator Certification Program Overall Performance

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- **414 applications processed in FY2008 at a 78 day averaged completion time**
- **Roughly 80% of applications processed in less than 90 days.**
- **Improving times for more complex test areas; 90% of CBRN applications less than 180 days**



# Post Approval Program

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- **Manufacturer Site Auditing**
- **Certified Product Auditing**
- **Certified Product Investigation Process (CPIP) (Poster)**
- **Firefighter Self Contained Breathing Apparatus (SCBA) Evaluation Lab**
  - Coordination with the Firefighter Fatality Investigation and Prevention Program NIOSH's Division of Safety Research
  - CPIPs opened on field complaints from non-fatal incidents
- **Long Term Field Evaluation**

# Updates to 42 CFR Part 84

## Current Status

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### ▪ Notices of Proposed Rulemaking (NPRM)

- Quality Assurance Module (published in federal register Dec 2008)
- Closed Circuit Escape Respirator (CCER) (published in federal register Dec 2008)
- Total Inward Leakage (TIL) for Air-Purifying Particulate Respirators (includes filtering facepiece respirators [FFR]) (in process)

### ▪ Concepts in Development

- Closed Circuit SCBA (CC-SCBA)
- Powered Air-Purifying Respirators (PAPR) (Poster)
- Supplied Air Respirators (SAR) (Poster)
- Air Fed Ensembles (Poster)
- TIL for Other Respirator Classes

***PPT Program Goal - develop two NPRM per year***

# Reduce Exposure to Inhalation Hazards

## Objective #2

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**Develop contemporary respirator standards to reduce exposure to known and emerging hazards including CBRN**

# CBRN Respirator Standards Development Activities

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- **Standards Completed:**

- SCBA – December 2001
- SCBA upgrades – March 2003
- Gas masks (APR) – March 2003
- Escape sets – October 2003
- PAPR – October 2006

- **Future CBRN Respirator Standards (SAR, CC-SCBA, Combination Units)**

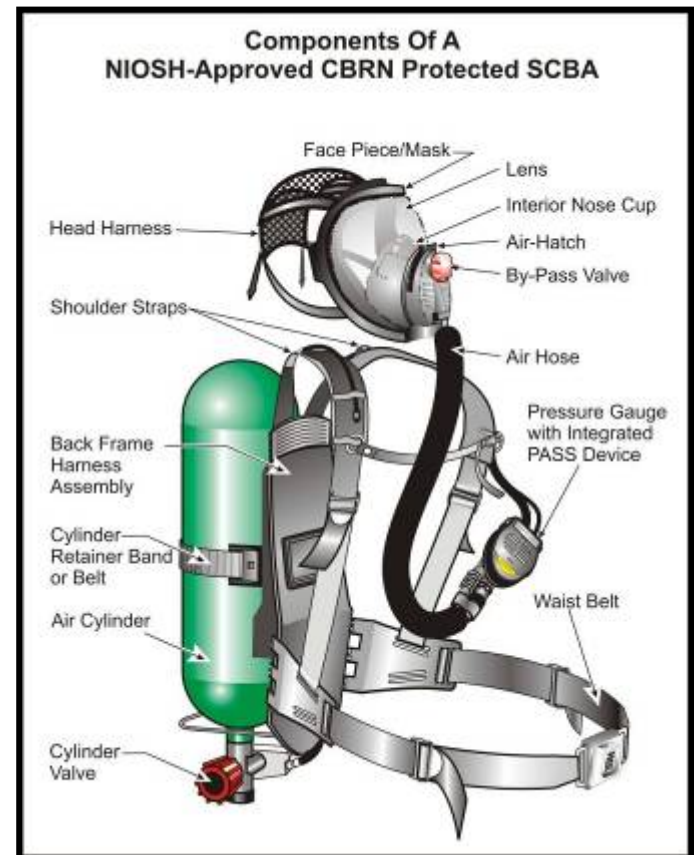
# CBRN Respirator Standards User Guidance

## ■ User guidance documents for:

- CBRN respirators
- PPE Applications
- Respirator Use and Selection

## ■ Planned Outputs (2009)

- CBRN SCBA User Guide
- CBRN SCBA Training Aid Pamphlet



# Reduce Exposure to Inhalation Hazards

## Objective #3

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**Advance the state of technology for closed circuit breathing systems for mine disasters and other emergencies**

# Mine Escape Respirator Activities

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- **Closed Circuit Escape Respirator (CCER) Standard**
- **Long Term Field Evaluation (LTFE)**
- **Dockable-Hybrid SCSR (Poster)**
- **Mine Refuge Chambers**



# Reduce Exposure to Inhalation Hazards

## Objective #4

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**Improve the reliability and level of respiratory protection provided by influencing respirator designs that better fit the range of facial dimensions of respirator users in the global workforce**



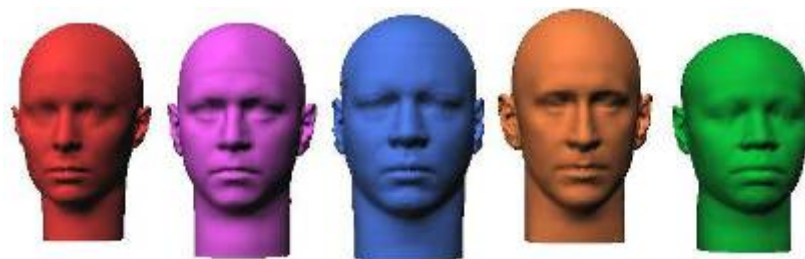
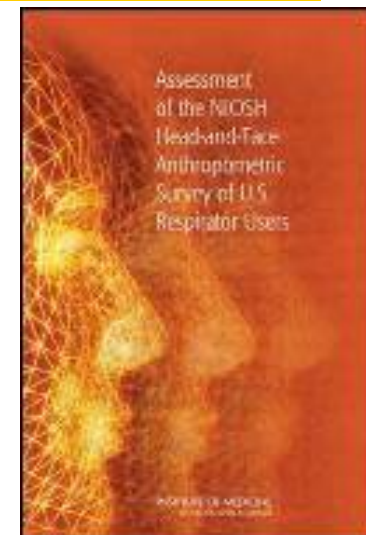
# Respirator Fit Activities

- **Update 42 CFR Part 84 with a Total Inward Leakage Test for Air-Purifying Particulate Respirators (including filtering facepiece respirators)**
  - Current status: NPRM in process
- **New respirator fit test capabilities**
  - NPPTL Building 40 State of the Art Respirator Fit Testing Laboratory
- **Workshop and research roadmap on "Innovations in Respirator Design and Fit Testing" (Presentation/Poster)**



# Respirator Fit Activities

- **Laboratory Study to Assess Causative Factors Affecting Temporal Changes in Filtering-Facepiece Respirator Fit (Poster)**
- **Computer-aided Face Fit Evaluations (Facial Anthropometrics) (Poster)**
  - 2003 US head and neck anthropometrics survey
  - 2007 Chinese head and neck anthropometrics survey
  - Study the relationships between face size and respirator fit
  - Respirator fit test panels
  - Headforms



# Reduce Exposure to Inhalation Hazards: Cross Cutting Objective #2

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**Understand and improve the effectiveness and usability of PPE to reduce the transmission of infectious bioaerosols**

# Respiratory Protection Against Infectious Bioaerosols

## ▪ New Technologies

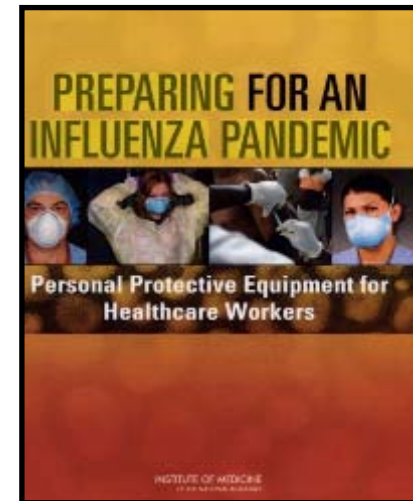
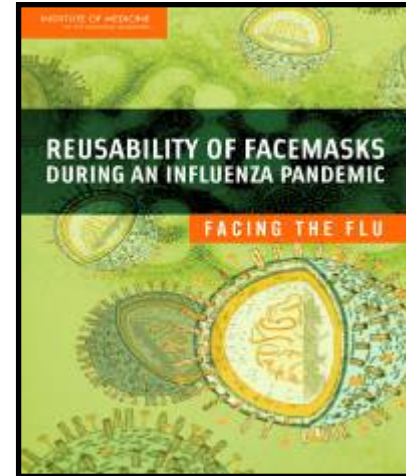
- Project BREATHE (**B**etter **R**espirator **E**quipment and **T**echnology for **H**ealthcare **E**mployees)

## ▪ Assessing strategies for overcoming a possible shortage of Filtering Facepiece Respirators (FFRs)

- Evaluation of the filtration performance of 21 N95 FFRs after prolonged storage (Poster)
- Reusability of FFRs\* (Poster)
- N95 Filtering Facepiece Respirator Preparedness: Healthcare Field Study Findings (Poster)

## ▪ Risks of Handling Contaminated FFRs

- Bioaerosol Test Methods for Respirator Decontamination\* (Poster)



\*Also supports cross cutting objective #4

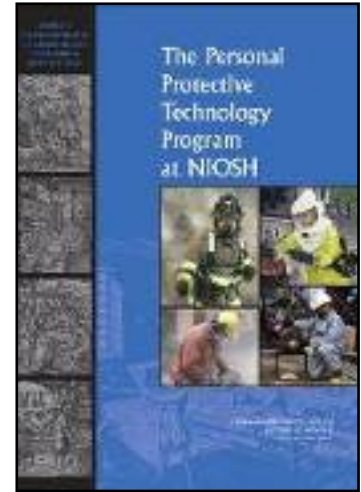
# Respiratory Protection Against Infectious Bioaerosols

## ■ Comfort and tolerability of FFRs

- Physiological Impact of the use of N95 FFR on Healthcare Workers\* (Poster)
- ABMS Evaluation of N95 Respirator Use with Surgical Masks\* (Poster)
- Thermal Imaging Analysis of Filtering Facepiece Respirators Surface Temperatures\* (Poster)

## ■ Performance

- N95 vs P100 Total Inward Leakage
- Respirator and Surgical Mask Protection from Cough Aerosols (Poster)
- Simulated Cough-generated Aerosol Particle Penetration Through Masks and Respirators (Poster)



\*Also supports cross cutting objective #1

# Reduce Exposure to Inhalation Hazards: Cross Cutting Objective #3

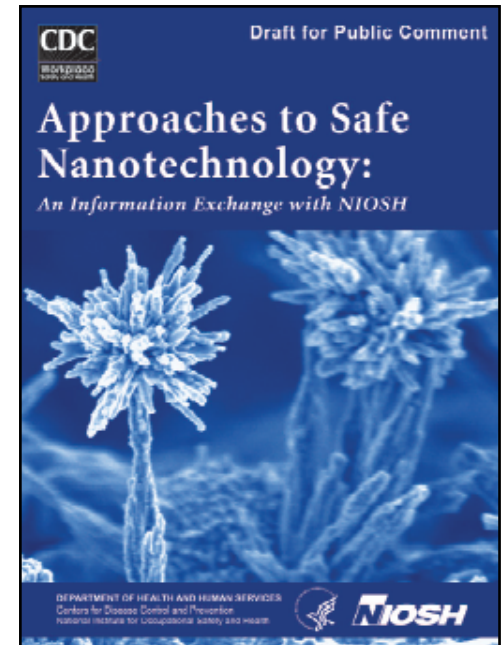
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**Evaluate the effectiveness of PPT  
for protection against nanoparticles**



# Respiratory Protection Against Nanoparticles

- **Comparison of Nanoparticle Filtration Performance of NIOSH-approved and CE Marked Filtering Facepiece Respirators (Poster)**
  - To date, the project has investigated the filtration performance of N95 FFRs, P100 FFRs, FFP2, FFP3, dust masks (not NIOSH approved), and surgical masks
  - Future focus is on face seal leakage
- **Participate on NIOSH Nanotechnology Research Steering Committee**



<http://www.cdc.gov/niosh/topics/nanotech/>

# Reduce Exposure to Inhalation Hazards

## Cross Cutting Objective #5

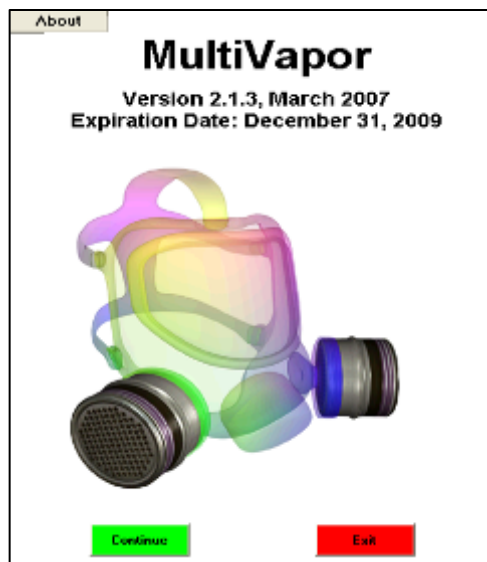
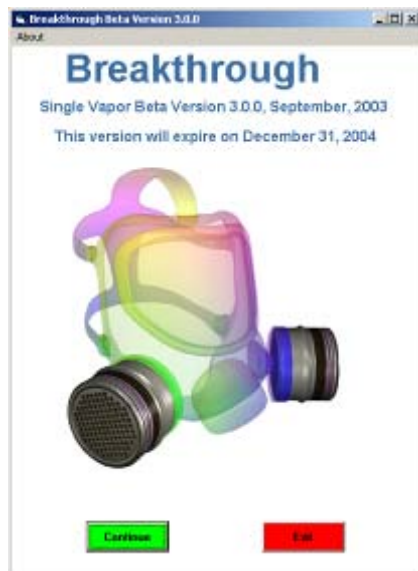
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**Develop and foster deployment of technologies that reliably sense or model PPT performance to ensure users receive effective protection**



# End of Service Life Indicators

- Respirator Cartridge End-of-Service Life Modeling (poster)
- Develop/Integrate Chemical Sensors for Real-Time Determination of Respirator Cartridge Service Life (poster)



# Summary

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- **PPT Program is conducting a wide range of projects that address the reduction of inhalation hazards strategic goal and its objectives**
- **The PPT program is working the tactical approach to develop personal protective standards through updates to 42CFR Part 84, as well as through national and international standards**
  - 2 NPRM published in 2008
- **New laboratory capabilities for generating bioaerosol challenges for respirator research address unique concerns resulting from pandemic planning and corn oil chamber for conducting respirator fit testing**
- **Outputs are being used to support/inform NIOSH, CDC, HHS, OSHA, and EPA guidance and standards development organizations**
  - 10 manuscripts published by intramural scientists in 2008 in peer-reviewed journals

# Quality Partnerships Enhance Worker Safety & Health



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***Disclaimer: The findings and conclusions in this presentation have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy.***

## Thank you



Workplace  
Safety and Health



**NPPTL** Research to Practice  
through Partnerships